CRUNCH Seminars at Brown, Division of Applied Mathematics

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Artificial Neural Networks Trained Through Deep Reinforcement Learning Discover Control Strategies for Active Flow Control (arXiv:1808.07664v5)

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This paper presents the first application of an Artificial Neural Network trained through a Deep Reinforcement Learning agent to perform active flow control. It is shown that, in a 2D simulation of the Karman vortex street at moderate Reynolds number (Re = 100), our Artificial Neural Network is able to learn an active control strategy from experimenting with the mass flow rates of two jets on the sides of a cylinder. By interacting with the unsteady wake, the Artificial Neural Network successfully stabilizes the vortex alley and reduces drag by about 8%. This is performed while using small mass flow rates for the actuation, on the order of 0.5% of the mass flow rate intersecting the cylinder cross section once a new pseudo-periodic shedding regime is found. This opens the way to a new class of methods for performing active flow control.